

Public Comments for Draft TSO-C164a

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Comments Submitted By: Michel Brulotte

Organization:

Personal Comments, Employer: Engineering Test Pilot, National Aircraft Certification, Transport Canada

Phone:

(613) 952-4317 (W)

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| 1 | TSO C164a | 1 | 3 | New models of head-mounted, binocular assembly, night vision goggles, which use P43 green-phosphor or P45W white-phosphor as the medium for energy amplification, meeting the . . . | I received a copy of the draft TSO C164a for information from a colleague. I was a member of the initial SC-196 as the Transport Canada representative for Aircraft Certification. I just read through the document and noted many very positive changes. There was one item that causes me some concern and it is in the first paragraph of section 3. I noted that very specific phosphor specifications have been included. We had specifically not included phosphor specifications since industry could develop different phosphors, and limiting the TSO to one or two specific types could have a negative impact on future performance benefits of newer phosphors. | I would suggest removing the reference to the specific phosphors. | Conceptual | Incorporated, will delete the specific phosphors while retaining the concept that monochromatic or achromatic (white) media are allowed. |
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Comments Submitted By: Robert Joslin

Organization:

AIR-100

Phone:

760-585-8793

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| 2 | TSO-C164A | 4 | 5(a)(1) | A Manual(s) containing the following: | The document does address mixing P43 and P45W on the same set of night vision goggles. Furthermore, a literature review of industry and DoD published research has not addressed this issue to date | Add the following statement as a requirement in the Manual: P43 and P45W shall not be combined on the same set of night vision goggles | Conceptual | Incorporated, will delete the specific phosphors while retaining the concept that monochromatic or achromatic (white) media are allowed but the chromacity of both image tubes must match. |
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Comments Submitted By: C. Davenport

Organization:

Phone:

817-431-9996

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| 3 | TSO-C164A | 1 | 2.a. | TSO-C164 will remain effective until <i>{insert calendar date 18 months after publication date}</i> . | 18 months seems a long time. Understand it can take awhile to develop engineering package and the production QM system documentation but 18 months allows for the approval of NVG under the current RTCA/DO-275 MOPS which has system gains that are substandard. | Decrease to 8 months to give manufacturers time to finish applications in work. | Conceptual | Not incorporated. While compliance with the updated performance standard is desired, current applicants meeting those standards can amend their pending application to reflect the updated TSO. Changing the withdrawal date of the existing TSO by 10 months is a significant change affecting the public and would require resubmitting the revised TSO for public comment. |
| 4 | TSO-C164A | 1 | 3 | New models of head-mounted, binocular assembly, night vision goggles, which use P43 green-phosphor or P45W white-phosphor as the medium for energy amplification, | Technically, the phosphor is not the medium for energy amplification. It is the means by which the image is supplied to the user. The amplification occurs prior to the phosphor screen. | Delete ". . .as the medium for energy amplification,. . ." | Conceptual | Incorporated. Changed to medium for image presentation, |
| 5 | TSO-C164A | 1 | 3 | New models of head-mounted, binocular assembly, night vision goggles, which use P43 green-phosphor or P45W white-phosphor as the medium for energy amplification, | Specifically calling out the phosphor type is unnecessary. The current technical document does not (white phosphor was available and in use in Europe at the time the MOPS was published.). Having the TSO specifically define the phosphor makes it too prescriptive particularly calling out "P45" and "P43". | Remove ". . .which use P43 or P45W white phosphor. . ." | Conceptual | Incorporated, will delete the specific phosphors while retaining the concept that monochromatic or achromatic (white) media are allowed but the chromacity of both image tubes must match. See #6. |

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| 6 | TSO-C164A | 1 | 3 | New models of head-mounted, binocular assembly, night vision goggles, which use P43 green-phosphor or P45W white-phosphor as the medium for energy amplification, meeting the design assumptions of Section 1 of RTCA Document No. (RTCA/DO)-275, Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment, dated October 12, 2001, identified and manufactured on or after the effective date of this TSO must meet the MPS qualification, and documentation requirements in Section 2 and the continued airworthiness requirements of Section 5 of RTCA/DO-275, as modified by appendix 1 of this TSO. | This is one sentence as published. Too long and difficult to read. | Suggest changing to: New models of night vision goggles identified and manufactured on or after the effective date of this TSO must meet the MPS set forth in Section 2 of RTCA/DO)-275, "Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment", dated October 12, 2001 as modified in Appendix 1 of this TSO. Airworthiness requirements of Section 5 of RTCA/DO-275, as modified by appendix 1 of this TSO. | Editorial | Incorporated as: New models of night vision goggles meeting the design assumptions of Section 1 of RTCA Document No. (RTCA/DO)-275, Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment, dated October 12, 2001, identified and manufactured on or after the effective date of this TSO must meet the MPS qualification, and documentation requirements in Section 2 and the continued airworthiness requirements of Section 5 of RTCA/DO-275, as modified by appendix 1 of this TSO. NVG meeting these performance standards must be head-mounted and provide binocular vision. The chromacity and performance of the vision tubes must match, but the medium for image presentation may be monochromatic, traditionally a green-phosphor, or achromatic, such as white-phosphor. Monocular NVG are not permitted under this TSO. |

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| 7 | TSO-C164A | 2,3 | 3.d | . . . You may use a different standard environmental condition and test procedure than RTCA/DO-160D with Change 3 provided the standard is appropriate for the night vision goggles. | During the development of the TSO revision, discussions were held with two of the leading technical experts in the NVG field regarding environmental qualification requirements for NVGs, one of whom was co-chair of the RTCA committee who drafted RTCA/DO-275. As a result of the discussion, it was clear that the current environmental qualifications are sufficient and should not be modified. The questions regarding this wording are: Is this new standardized wording for TSOs? Who makes the determination that the different standard and test procedure is appropriate? | Delete the sentence. If it is felt that requiring use of RTCA/DO-160 is too restrictive, then suggest adding wording that refers to 3.g. Deviations to formalize the process. In this case suggested wording: You may use a different standard environmental condition and test procedure than RTCA/DO-160D with Change 3 but must apply for a deviation to the TSO as per paragraph 3.6. and 14 CFR 21.618. <i>(or something similar)</i> | Conceptual | Partially incorporated, d. Environmental Qualification. Demonstrate the required performance under the test conditions specified in RTCA/DO-275, Sections 2.3 and 2.5 using standard environmental conditions and test procedures appropriate for airborne equipment in RTCA/DO-160D with Change 3 or in Military Standards (Mil-Std) 810C and 461. You may use subsequent versions of RTCA/DO-160 or its EUROCAE equivalent standard environmental conditions and test procedures provided the standard is appropriate for the night vision goggles. |
| 8 | TSO-C164A | 2,3 | 3.d | Demonstrate the required performance under the test conditions specified in RTCA/DO-275, Sections 2.3 and 2.5 using standard environmental conditions and test procedures appropriate for airborne equipment. <i>And notes 1, 2</i> | There is no mention of 160D other than one does not have to use it and if one uses other than Change 3 they need to substantiate. The wording in the original TSO was clear and succinct. Adding the original wording to the end of the proposed wording defines the testing standard and helps explain Notes 1, 2. | Suggest adding the wording from the original TSO to the end of the sentence. New paragraph would read: "Demonstrate the required performance under the test conditions specified in RTCA/DO-275, Sections 2.3 and 2.5 using standard environmental conditions and test procedures appropriate for airborne equipment. Test the equipment to the conditions stated in RTCA/DO-160D, Environmental Conditions and Test Procedures for Airborne Equipment, through Change 3, dated December 5, 2002, or as otherwise specified in RTCA/DO-275, Sections 2.3 and 2.5" | | Partially incorporated, d. Environmental Qualification. Demonstrate the required performance under the test conditions specified in RTCA/DO-275, Sections 2.3 and 2.5 using standard environmental conditions and test procedures appropriate for airborne equipment in RTCA/DO-160D with Change 3 or in Military Standards (Mil-Std) 810C and 461. You may use subsequent versions of RTCA/DO-160 or its EUROCAE equivalent standard environmental conditions and test procedures provided the standard is appropriate for the night vision goggles. |

Comments Submitted By: Richard Johnson

Organization: Aviation Specialties Unlimited, Inc.

Phone: 208 287 5421

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| 9 | TSO-C164a | 1 | 3 | 3. REQUIREMENTS. New models of head-mounted, binocular assembly, night vision goggles, which use P43 green-phosphor or P45W white-phosphor as the medium for energy amplification, meeting the design assumptions of Section 1 of RTCA Document No. (RTCA/DO)-275, Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment, dated October 12, 2001, identified and manufactured on or after the effective date of this TSO must meet the MPS qualification, and documentation requirements in Section 2 and the continued airworthiness requirements of Section 5 of RTCA/DO-275, as modified by appendix 1 of this TSO. | Should reference equivalent to P43 Green and P45 White phosphor in case of future change or adjustment in phosphor source material.and/or chemistry. | " . . . which use P43 green-phosphor or equivalent or P45W white-phosphor or equivalent . . ." | Conceptual | Incorporated, will delete the specific phosphors while retaining the concept that monochromatic or achromatic (white) media are allowed but the chromacity of both image tubes must match. |
| 10 | TSO-C164a | 3 | 4.b. | Mark Heads Up Display (HUD) compatible NVGs "Modified Class B" for NVGs with a modified Class B filter designed to allow their use with a HUD. | Is this just a Class C filter as defined in MIL-STD-3009? | | Conceptual | It is a "notched" Class B filter to allow the HUD to be visible through the NVG. RTCA/DO-275 only allows standard and modified Class B filters. Performance specifications for both types are listed in DO-275. |

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| 11 | TSO-C164a | 4 | 4.c.(2) | (2) Each subassembly of the article that you determined may be interchangeable to include replaceable tubes. | Does this relate only to MX-160 configuration image intensifier tubes? Can a "relaceable tube" include a class of image tube with flying leads? | | Conceptual | <p>We do not specify technologies, but leave it to the applicant to determine how to meet the performance standards. We do require the interchangeable parts to be marked.</p> <p>The OEM defines the design and configuration to meet the performance requirements of the TSO. Additionally, they define the maintenance/repair/allowable modifications in order to keep the article in an airworthy condition as part of the TSO requirements. Therefore, the OEM in their design needs to indicate acceptable replacement tubes by PN if they wish to allow different tubes to be installed (other than the originally installed tubes) and those tubes should also have markings. The tube technology is a function of the design. The TSO establishes performance not design.</p> |
| 12 | TSO-C164a | 6 | 5.i. | List of all drawings and processes (including revision level) that define the article's design. | This defines the entire technical drawing package for an NVG system. How is a company's proprietary data protected once in the FAA's hands? | | Conceptual | The company must mark all information it considers proprietary as such. The FAA holds that data in trust and protects it from disclosure to third parties in accordance with approved policy and orders. |

Comments Submitted By: Mark Millican

Organization: N/A

Phone: 505-296-2742

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| 13 | TSO-C164a | 2 | c2a | (a) Provide separate and independent power sources to each tube, or | Will this require a separate battery pack for each tube? Will it require spare battery packs for each tube? | I only see this adding weight to the NVGs and helmet which isn't necessary. I would stay with option b. | | True that the independent power supplies may add weight. Since the TSO is a performance based document rather than specifying a particular means of reaching that performance, the applicant has a choice in how to meet the standard. In this case, most applicants are likely to choose option B, but they make engineering and business decisions on how to best meet the requirement. |
| 14 | TSO-C164a | 3 | d, note 2 | Note 2: RTCA/DO-275, Sections 2.3 and 2.5 also provide guidance for environmental testing to Military Standards (Mil-Std) 810C and 461. In this case you must provide an environmental qualification form similar to that required by paragraph 5.a.(5) of this TSO. | If you've tested to, and met mil std why do you have the additional requirement of an environmental qualification form? | Seems redundant and unnecessary. Delete requirement for environmental qualification form. | | The form requirement is for the TSO applicant to provide appropriate documentation of the tests performed to gain TSO approval. The RTCA performance specification allows the alternate environmental test and we specify how to document the results of that alternate testing so that we may evaluate it for compliance. |

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| 15 | TSO-C164a | 11 & 12 | 5.4 (Table 5-1) | Airframe Mechanic (currently yes in all columns) | None of this is preventive maintenance. It is a requirement for flight. And I don't want the airframe mechanic doing anything with my NVGs. | Delete Airframe Mechanic from this table. | | Incorporated with changes. The TSO modifies the allocations in the RTCA/DO-275 standard by including non-pilot crew members and relieving the pilot/crew member of the record keeping requirements required in the DO for all persons performing these actions. When performed by the pilot/crew member, these actions are pre-flight items. Operator can be mis-construed to mean the company operating the aircraft. We are changing operator to crew member to properly reflect the actual in-flight users of the NVG. When performed by an Airframe Mechanic or Repair Station, they are maintenance actions for the continued airworthiness of the NVG and need to be documented. |
| 16 | TSO-C164a | | 2 3a | Note that the equipment is portable (battery powered), with no interface with aircraft systems. | Slides 5 and 9 of the briefing speak to separate design approval. Is this requirement for each different type of aircraft flown in EMS? The environment can't be that different between aircraft. | You've already said in your own TSO that "the equipment is portable with no interface with aircraft systems". Why are you now requiring a separate design approval? The US military has used NVGs for years and have proven them to be "suitable" and "safe". Do you expect EMS crews to be operating in harsher environments? Delete requirement for a separate design approval since your own TSO states they have no interface with aircraft systems. | | The TSO approval is for the design and production of the NVG appliance only. Operational approval for use in flight is contingent on a separate approval of NVG compatible lighting on the aircraft as well as aircrew certification and training. While the Military environment is harsher than what is normally encountered in EMS or wildlife protection, the requirement to qualify the aircraft and crew do require separate approvals from that required to produce the goggles themselves. |

Comments Submitted By: Matthew S. Zuccaro

Organization: Helicopter Association International (HAI)

Phone: 703-683-4646

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| 17 | TSO C164a | 1 | 3a | | We commend the Aircraft Certification Standards Service for initiating this update of TSO-164. It is clearly appropriate. NVG technology and equipment has developed significantly over the past decade and the standards need to keep pace with this rapid change. HAI has reviewed the proposed revisions and has circulated the draft order to representatives of member companies in law enforcement and air medical services, the two segments of our industry which extensively use NVG technology. We also sought input from our associate members involved in maintenance and training for night vision equipage. | None of our members voiced any concerns with the proposed revisions. It was agreed that the revisions were appropriate, and accurately reflect advances in battery and lighting technology and the increased maturity of NVG systems. As a result, HAI concurs with the proposed revisions provided in TSO. | Conceptual | No action required. |

Comments Submitted By: Clayton Vondrasek

Organization: Garmin International

Phone: 913-440-5019

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| 18 | TSO-C164a | 11 | Appendix 2 | Comment applies to entire Appendix | There are many other existing pieces of equipment with embedded batteries that meet various TSOs, none of which have specific requirements for batteries embedded in the equipment. It seems inappropriate to include battery requirements in this TSO or any other TSO. It seems more appropriate to have installation guidance which would apply to all equipment. Creating requirements on what sizes of batteries apply and types of battery chemistry is beyond the scope of this TSO. | Remove Appendix 2. or At a minimum, remove all requirements indicating acceptable battery sizes and use of battery chemistries. A more appropriate requirement would be to just require in the installation manual, size of battery, battery chemistry, and instructions for use that can be used for installation considerations. | Conceptual | Incorporated Appendix 2 removed, Due to the differing performance levels offered by different battery chemistries, it is crucial that the applicant identify what kind of batteries meet the performance requirements. Commercial AA batteries are currently used in most NVG applications and this TSO update specifically permits their continued use. Higher capacity batteries carry additional safety risks and will require additional approvals through the deviation process. |
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